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(54) Method and system for automatically detecting and checking parking places

Verfahren und System zur Detektierung und Überprüfung von Parklücken

Procédé et système de détection et contrôle automatique de places de parking.

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Description

[0001] The invention relates to a method for automatically detecting and checking the use of at least a number of parking places, according to appended claims 1-6. The invention furthermore relates to a system for use of the method according to appended claims 7-13.

[0002] In the following description, "parking place" is understood to mean a parking spot or a parking bay or parking space for a single vehicle. "Parking arrangement" is understood to mean an array of a number of parking places, such as, for instance, a parking lot, a parking garage, a parking zone, a parking lane or the like. "Vehicle" is understood to mean any type of vehicle that can be placed in a parking place, such as, for instance, a passenger car, a motorcycle, a van, a camper, an auto-bus, trailer, etc.

[0003] An example of a parking arrangement in which the present invention can be used is described in Dutch patent 2001 994.

[0004] In the parking arrangement known from Dutch patent 2001994 or similar parking arrangements with a vehicle detection system, with the aid of parking sensor modules, which, for instance, can each comprise one or more magnetic sensors, the presence or absence of a vehicle in a particular parking place can be detected wirelessly. In the known arrangements, a signal representing the status of a parking place, i.e., "occupied" or "vacant", is passed on to a central computer via a parking sensor network present for that purpose, in this description briefly named parking network. The parking network can be a wireless or a cabled network or a combination of the two, but is preferably a substantially wireless network.

[0005] In these known parking arrangements it is thus always known which parking places are occupied and which parking places are not occupied. Oftentimes, however, it is desirable to know, at least of a number of parking places of a parking arrangement, by whom a parking place has been put into use. For instance, particular parking places may be reserved or intended for specific groups of users and/or specific vehicles. Thus, for instance, a number of parking places of a parking arrangement may be intended for the disabled. Also, parking places may be reserved for license-holders, or for VIP parkers, or for rental cars, for instance at an airport. These may be both specific parking places and parking places to be freely chosen by the user. Regarding such parking places, the need exists to be able to detect, preferably automatically, whether a parking place is being used by a person and/or vehicle authorized to do so.

[0006] A method and system of the above-mentioned kind are known from EP 2 418 508 A1 (Selex Elsag). This reference describes a method and apparatus for determining whether a parking place is occupied, and if so, whether the parking place is occupied legitimately or illegitimately. To this end, either the parking sensor modules or the license devices, or transmitting devices communicatively connected therewith in the vehicles, are

configured to transmit in succession both the identification code of a parking sensor module and the identification number of a license device to an access point connected with a central processing unit.

[0007] In WO 2007/066020 (RFID Systems) a method is described for detecting a rightful or wrongful occupation of line-up places or landing places for mobile devices, in particular pleasure boats. For this purpose, use is made of sensors arranged at each landing place, which are provided with a position code and which can detect the presence or absence of a vessel, though not the identification code of a vessel. The identification code of a vessel is stored in a transponder which can be read out electronically at a great distance. The transponders are read out wirelessly by a single or a minor number of interrogation devices. On the basis of the read-out identification codes and the position codes of the occupied and/or vacant landing places, a central processing unit determines approximately whether the occupied landing places are occupied rightfully or not.

[0008] WO 2011/024161 discloses a parking system a plurality of Curb devices, a plurality of Car Devices and a Host. Each Curb Device has its own unique Curb Device ID and is installed close to a corresponding parking space. The Curb device is provided with a sensor for sensing a physical positioning of a car within the respective parking space. Each Car Device is provided with its own unique Car Device ID and is positioned at a corresponding car at a location. The Host is provided with Users Data and Parking Spaces Data, for remotely managing, billing, enforcing and controlling on line and in real time parking of vehicles at each of said parking spaces.

[0009] According to the invention, the license devices are provided with motion sensor means, which together with time measuring means can determine exactly at what time a vehicle comes to a standstill; the transmitting means are configured to transmit information about said time together with the identification number of the license device of the respective vehicle to the central computer; and the central computer by matching said time with times at which the parking places become occupied determines in which parking place the respective vehicle is parked.

[0010] It is noted that from US 2004/0192352 A1, as such, the use of a motion sensor in a vehicle is known. This known motion sensor, however, does not work together with time measuring means and is not part of a license device for cooperation with a parking sensor network, but is part of a tracking device. After the vehicle has come to a standstill, the known motion sensor activates a GSM apparatus, in order to initiate a locating action via the GSM network. A determination of the time at which a parking place becomes occupied is not known from this reference.

[0011] It is further noted that WO 2007/045250 (Car-time Technologies) describes a method for automatic payment of traffic-related amounts, such as, for example, parking fees. To this end, the position of a vehicle is de-

terminated with the aid of a mobile device which is in the vehicle, in two steps. In a first step the position of the vehicle is approximately determined with the aid of a satellite system, such as, for example, GPS or Galileo. The thus established rough position is thereupon corrected with so-called EGNOS (European Geostationary Navigation Overlay Service) corrections. The thus established position is thereupon transmitted to a central computer. However, no use is made of any parking sensor modules. Nor does the mobile device which is in the vehicle comprise any motion sensor which cooperates with time measuring means. Although it is determined whether the vehicle is standing still or moving, this is done by verifying for a short period of time whether the position determined by the satellite system changes or not. Time measurement takes place in the central computer.

[0012] In the following, the invention will be described in more detail with reference to the appended drawings.

Figure 1 shows schematically an example of a map of a parking arrangement, in which the invention can be used;

Figure 2 shows schematically an example of a vehicle detection system for a parking arrangement of the type shown in Figure 1;

Figure 3 shows schematically a block diagram of an example of a license device according to the invention;

Figure 4 shows by way of example a possible time diagram of the use of a parking place and the associated status of a license device according to the invention; and

Figure 5 shows schematically a time diagram of an example of, and possible course of, the signal provided by the motion sensor of a license device according to the invention and of the corresponding status of the license device.

[0013] Fig. 1 shows schematically a map of an example, already described in applicant's older Dutch patent application NL 2006154, of a parking arrangement 1, in this case a parking lot, where the invention can be used. The parking lot comprises a number of parking places P, which, in this example, are each provided with a parking sensor module S, also named sensor node, symbolized with a dot. Furthermore, in this example an entrance 4 and an exit 5 are present.

[0014] Fig. 2 shows schematically an example, likewise already described in applicant's older Dutch patent application NL 2006154, of a vehicle detection system 20, which can be used in a parking arrangement of the type shown in Fig. 1, i.e., a parking arrangement with parking places which are each provided with at least one sensor node S. The vehicle detection system 20 shown comprises a number of sensor nodes denoted with $S_1, S_2, \dots, S_n, S_{n+1}, \dots, S_m$, which, as described in the above-mentioned older Dutch patent application NL 2006154 and in applicant's already mentioned Dutch patent NL

2001994, can comprise, for example, magnetic sensors. In this example, though not necessarily so, the sensor nodes are divided into a number of groups, whereby the sensor nodes of a group can communicate with an intermediate station, which in turn can communicate with the central computer of the vehicle detection system.

[0015] In the example shown, the sensor nodes $S_1, \dots, S_n$ form a first group 21 and the sensor nodes $S_{n+1}, \dots, S_m$ form a second group 22. Group 21 can communicate with an associated intermediate station 23 via a connection 24, while group 22 can communicate with an intermediate station 26 via a connection 25.

[0016] The intermediate stations 23 and 26 can communicate with the central computer 29 via connections 27, 28. The connections 24, 25, 27 and 28 could, if desired, consist wholly or partly of wired connections, but are preferably wireless connections. When in a parking place a condition change occurs, as a result of a vehicle arriving or leaving, this is detected by the sensor node associated with that parking place and passed on via the associated intermediate station to the central computer.

[0017] It is noted that, as also described in the above-mentioned Dutch patent application 2001994, a parking arrangement according to the invention may also be so configured that the sensor nodes communicate directly or via other sensor nodes with the central computer without intervention of intermediate stations such as the intermediate stations 23 and 26.

[0018] It is further noted that, if desired, it is possible to provide a parking place with more than one sensor node. In the present description of an exemplary embodiment of the invention, the starting point is an automatic vehicle detection system with a single sensor node per parking place. Further, more or fewer than two groups of parking places with associated sensor nodes may be used, depending on the nature of the parking arrangement.

[0019] A parking arrangement of the above-described kind may be wholly or partly laid out with specific parking places for special groups of users. Thus, for example, a number of parking places may be intended for the disabled. Also, a part of the parking arrangement may be intended for license-holders or for VIP parkers. Furthermore, particular parking places may be intended for cars to be rented or for subscribers, etc.

[0020] In Fig. 1 there are shown, by way of example, a first group of parking places for the disabled, indicated at I, and a second group of parking places for VIP parkers, indicated at II. Further, at III a group of parking places for subscribers or license-holders is indicated.

[0021] In order to be able to check a correct use of the various parking places and/or to be able to verify if any, and if necessary what amount of, fees are to be charged for the use of particular parking places, it is important to be able to check automatically who, and what vehicle, respectively, is making use of a parking place. Another use may be, for example, tracing a (rental) vehicle in the parking lot.

[0022] According to the invention, to this end, use is made of an electronic license (E-license), which is embodied in an electronic license device, which can be carried along in or on a vehicle of a license-holder.

[0023] Fig. 3 shows schematically an exemplary embodiment of a license device according to the invention. The license device 30 shown, which could also be named (license) pass, license means, etc., while the term "license" could be replaced with the term "permit" or a similar term, comprises a memory 31, in which a unique identification number is stored and which is connected with a microprocessor 32. The license device 30 furthermore comprises very low energy motion sensor means 33, hereinafter also named motion sensor, which is likewise connected with the microprocessor. Such an energy-saving motion sensor is commercially available, for example, from Analog Devices or from VTI Technologies. From VTI Technologies, the type CT/A3000-D01 is suitable for use in a license device according to the invention. Further, time measuring means comprising an accurate crystal 34 and a clock circuit 35, which indicates the real (local) time (RTC = Real Time Clock), are connected with the microprocessor.

[0024] The license device comprises furthermore an UHF radio circuit 36, which is connected with the microprocessor and in operation is controlled by the microprocessor, and which is provided with an antenna 37. Finally, an energy source in the form of a battery 38 is present to provide the license device with the necessary supply voltage.

[0025] The invention is based on the idea that it is possible, on the basis of a comparison of the exact time, determined by the motion sensor 33, at which a vehicle present in the parking arrangement comes to a standstill, with the exact moment at which a parking sensor module indicates that the associated parking place is becoming occupied, to determine above which parking sensor module and hence in which parking place the vehicle is parked. When the vehicle stands parked, via the UHF radio circuit the unique number of the license device and a signal representing the exact time of standstill are transmitted, and received by a wireless parking network of the parking arrangement and/or by a UHF receiver connected with the central computer of the parking arrangement. The central computer can then determine which parking place was becoming occupied at the same moment and thus link this (most probable) parking place to the respective license device. Thereupon it can then be determined whether the vehicle is in a permitted parking place, and/or the parking duration should be measured, etc.

[0026] More in detail, the electronic license system functions as follows. When a vehicle that is provided with an electronic license device according to the invention starts driving, this is detected by the very low energy motion sensor. When after a settable short wait time the vehicle is still in motion, the status of the license device changes from STANDING STILL to IN MOTION. When the vehicle has arrived at the parking lot provided with a

parking network and has been parked, the motion sensor detects that the vehicle is standing still. After a settable wait time the status of the license device changes to STANDING STILL and the exact moment of standstill is stored internally. All this is schematically graphically represented in Fig. 4. Fig. 4 shows in the upper time line PP the condition of a parking place, which can be VACANT or OCCUPIED. In the lower time line "Status", by way of example, the status of a license device is represented. At a random starting time t_0 , the parking place is occupied, as indicated at 40, and the vehicle provided with the license device is moving (41). At some point, the vehicle enters the parking lot and is parked in the parking place which has meanwhile become vacant (42). Consequently, the parking place is occupied from time t_1 (43). This fact is passed on via the parking network and stored in the central computer. A short time later, at time $t_1 + \Delta t_1$, the status of the license device changes to STANDING STILL (44). The exact moment of standstill, i.e., time t_1 , is then stored internally in the working memory of the microprocessor of the license device. Time Δt_1 is a short wait time to prevent the status of the license device being changed already in the event of an intermediate brief interval of standstill. The wait time Δt_1 is preferably settable and, depending on the wishes of the operator and/or user, may last, for example, a few seconds to a couple of minutes. In a practical situation, Δt_1 can be, for example, about 10 seconds.

[0027] At time $t_1 + \Delta t_1$, via the UHF radio circuit 36, 37, the parking network and/or the central computer are approached. As soon as a link is established, the internal clock 35 is synchronized with the clock of the parking network to compensate any time differences between the license device and the parking network. If necessary, also time t_1 is then adapted. Next, via the UHF radio link 36, 37, a message including the identification number of the license device and the exact moment of standstill is transmitted to the parking network and/or the central computer. The parking place has become occupied from time t_1 , as indicated with 43, which is detected by the parking sensor module of that parking place and is passed on via the parking network to the central computer. The information from the parking sensor module and from the license device is stored in a database. Through combination of this information, as already noted, the license device can be linked to a most probable specific occupied parking place and the result thereof can be processed further.

[0028] In the diagram shown in Fig. 4, the status of the license device changes at time t_2 again, to IN MOTION (45). This occurs after a short wait time Δt_2 after the vehicle has actually started to move, so as to be sure that the vehicle is indeed driving away from the parking place. The parking sensor module at the same time indicates that the parking place is vacant again (46). This parking place may subsequently be occupied again by another vehicle, as indicated at 47. If desired, the time t_2 may also be transmitted via the parking network or directly to

the central computer, and through a comparison of times as described earlier, it may be checked whether the vehicle does indeed drive away from the parking place previously linked to it. However, when the vehicle moves beyond the range of the parking network, the license device cannot communicate with the parking network anymore, so that it becomes automatically clear that the vehicle has left the parking lot.

[0029] Fig 5, for completeness' sake, shows once again in a time bar a possible course of a signal provided by a motion detector BS, together with an associated status of the license device in a method and apparatus according to the invention. The time bar starts with an interval 50, in which the vehicle is standing still and the status of the license device is STANDING STILL. During the interval 50, in this example, the motion sensor generates a short signal 51 twice. These signals, however, occur so briefly that the wait time Δt_2 (Fig. 4) is not exceeded, so that the status of the license device does not change. Such signals may occur, for instance, due to a gust of wind or someone or something bumping against the vehicle. At time t_3 the vehicle starts moving and although shortly afterwards a brief stop occurs as indicated at 52, this stop does not exceed the wait time Δt_2 and the status of the license device remains IN MOTION. Despite further short stops, indicated at 54, the status of the license device remains unchanged until at time t_4 the vehicle comes to a standstill long enough for the status to change back again to STANDING STILL. After the earlier-described wait time, the license device starts to approach the parking network via the UHF radio circuit 36, 37. If no parking network is found, the vehicle is parked some place where there is no parking network. The UHF radio circuit is then preferably switched off until a new STANDING STILL status is detected. Also during the status IN MOTION, the UHF radio circuit is preferably switched off. In this way, the relatively high-energy UHF radio is switched on selectively and as briefly as possible, and a relatively long life of the battery 38 is obtained.

[0030] If a parking network is found, the events already described above proceed to take place, whereby the license device is recognized and the parking place where the vehicle is, is determined.

[0031] By linking ("matching") the time at which a vehicle comes to a standstill to the time at which a parking sensor module delivers an occupation signal, it can be determined with high accuracy in which parking place the vehicle is parked. Especially in the case of a very busy parking arrangement it is possible, in theory, that two parking places become occupied at virtually the same time. For this reason it has already been indicated above that the central computer determines the most probable parking place where a vehicle provided with a license device is parked. The central computer may also, if desired, be so configured that it provides a list of possible parking places where a vehicle may be parked, arranged according to the degree of probability.

[0032] If desired, the chances that the central computer

matches an incorrect parking place with a license device may be reduced by applying a secondary locating system. To this end, the motion sensor can be used to switch on, directly or via the microprocessor, a typically high-energy additional locating system, such as, for example, GPS or Galileo or the like or a local locating system, such as described, for example, in NL 2005776. All this is indicated in Fig. 3 with an interrupted arrow 39 to a block GPS. After the motion sensor has detected that the vehicle is parked, the motion sensor, to this end, directly or indirectly, in this example via the microprocessor 32, briefly switches on the additional locating system until the extra location information is available. Then this extra information can also be transmitted to the central computer, so that the latter can determine still more accurately in which parking place the vehicle is parked.

[0033] The energy-saving motion sensor can also be used to give the user an audio/visual feedback message. At the moment that the motion sensor detects motion and the license device goes from status STANDING STILL to status IN MOTION, the driver of the vehicle is present in the vehicle and various messages may be delivered, for example, E-license functioning, battery low, or the like.

[0034] It is noted that after the foregoing, diverse modifications will readily occur to those skilled in the art. Such modifications are understood to fall within the scope of the invention as defined in the appended claims.

Claims

1. A method for automatically detecting and checking the use of at least a number of parking places (P) and whether a parking place is occupied by an authorized vehicle or person, wherein each of said parking places is provided with at least one electronic parking sensor module ($S_1 - S_m$), of a parking arrangement (1), which is provided with a parking network (20-28) for communication between the electronic parking sensor modules ($S_1 - S_m$) and a central computer (29), wherein the electronic parking sensor modules ($S_1 - S_m$) are each provided with an identification code and with at least one vehicle sensor for detecting the presence or absence of a vehicle in the respective parking place (P), said electronic parking sensor modules being arranged for signalling to the central computer (29) when a parking place becomes occupied or vacant; and wherein vehicles, which can be parked in said parking places (P), are each provided with an electronic licence device (30), the license devices (30) being each provided with motion sensor means (33) and time measuring means (35) as well as with a unique identification number and with transmitting means (36, 37) to transmit the identification number of the license device (30) of a respective vehicle to the central computer (29), wherein the central computer (29)

is configured to determine in which parking place (P) the respective vehicle is parked, **characterized in that** motion sensor means (33), together with the time measuring means (35) are arranged to determine exactly at what time (t1) a vehicle comes to a standstill; wherein the transmitting means (36, 37) are configured to transmit said exact time (t1) together with the identification number of the license device of the respective vehicle to the central computer (29); and wherein the central computer is arranged to determine in which parking place the respective vehicle is parked by matching said time (t1) as provided to the central computer (29) by said transmitting means (36, 37) with times at which the parking places (P) become occupied as signaled to the central computer (29) by the electronic parking sensor modules (S1-Sm).

2. A method according to claim 1, wherein after the time (t1) at which the vehicle comes to a standstill a short period (Δt_1) of waiting follows before the license device (30) approaches the central computer (29) by means of the transmitting means (36,37).
3. A method according to claim 1 or 2, wherein after the vehicle has come to a standstill, by the motion sensor means (33) directly or via a microprocessor an additional locating system is switched on for providing extra location information.
4. A method according to any one of claims 1 to 3, wherein time measuring means (35) are used, which comprise a real time clock, and that the real time clock is synchronized with a clock of the parking network (21 to 28) and/or the central computer (29), before the time at which a vehicle comes to a standstill is compared with the times at which parking places (P) become occupied.
5. A method according to any one of claims 1 to 4, wherein the transmitting means (36, 37) are switched off as long as the vehicle is in motion, and when the vehicle is parked in a place where no parking network (21 to 28) is present.
6. A method according to any one of the preceding claims, wherein with the aid of the motion sensor means (33) and the time measuring means (35) it is determined at what time (t2) a parked vehicle drives away from a parking place and that the transmitting means (36, 37) transmit information about said time (t2) together with the identification number of the license device carried by said vehicle to the central computer (29).
7. A system for automatically detecting and checking the use of at least a number of parking places (P) and whether a parking place is occupied by an au-

thorized vehicle or person,
wherein the system comprises:

a central computer,
at least one electronic parking sensor module (S1-Sm), wherein each of said parking places is provided with at least one electronic parking sensor module (S1-Sm) of a parking arrangement (1),
a parking network (20-28)
which is provided with the parking arrangement for communication between the electronic parking sensor modules (S1 - S_m) and the central computer (29),
wherein the electronic parking sensor modules (S1 - S_m) are each provided with an identification code and with at least one vehicle sensor for detecting the presence or absence of a vehicle in the respective parking place (P), said electronic parking sensor modules being arranged for signalling to the central computer (29) when a parking place becomes occupied or vacant; and
wherein the system furthermore comprises one or more electronic license devices (30), adapted to be carried along with the vehicles which can be parked in said parking places (P), the license devices (30) being each provided with motion sensor means (33) and time measuring means (35) as well as with a unique identification number and with transmitting means (36, 37) to transmit the identification number of the license device (30) of a respective vehicle to the central computer (29),
wherein the central computer (29) is configured to determine in which parking place (P) the respective vehicle is parked,
characterized in that the motion sensor means (33), together with the time measuring means (35) are arranged to determine exactly at what time (t1) a vehicle comes to a standstill; wherein the transmitting means (36, 37) are configured to transmit said exact time (t1) together with the identification number of the license device of the respective vehicle to the central computer (29); and wherein the central computer by matching said time (t1) as provided by said transmitting means (36, 37) with times at which the parking places (P) become occupied as signaled to the central computer (29) by the electronic parking sensor modules (S1-Sm), is adapted to determine in which parking place the respective vehicle is parked.

8. A system according to claim 7, wherein the license device comprises a microprocessor (32), which is connected with the motion sensor means (33) and with time measuring means (34, 35) and

which is furthermore connected with a UHF radio circuit (36, 37) of the transmitting means for sending information to the central computer (29).

9. A system according to claim 7 or 8, wherein the motion sensor means (33) are configured for, after a vehicle has come to a standstill, directly or via a microprocessor switching on an additional locating system for providing extra location information.
10. A system according to claim 9, **characterized in that** the license devices (30) are configured to transmit also the extra location information to the central computer (29).
11. A system according to any one of claims 7 to 10, wherein the time measuring means (34,35) comprise a real time clock (35) and that the license devices (30) are configured to synchronize the real time clock (35) with a clock of the parking network (21 to 28) and/or the central computer (29) before the time at which a vehicle comes to a standstill is compared with the times at which parking places (P) become occupied.
12. A system according to any one of claims 7 to 11, wherein the license devices (30) are configured to switch off the transmitting means (36, 37) as long as the vehicle is in motion and when the vehicle is parked in a place where no parking network is present.
13. A system according to any one of claims 7 to 12, wherein the license devices are configured to determine at what time (t2) a parked vehicle drives away from a parking place provided with a parking sensor module (S1-S_m) and to transmit information about this time (t2) together with the unique identification number to the central computer.

Patentansprüche

1. Verfahren zum automatischen Erkennen und Überprüfen der Benutzung von wenigstens einer Anzahl von Parkplätzen (P) und ob ein Parkplatz von einem berechtigten Fahrzeug oder einer berechtigten Person belegt ist, wobei jeder der Parkplätze mit wenigstens einem elektronischen Parksensormodul (S1 - S_m) einer Parkanordnung (1) versehen ist, die mit einem Parknetzwerk (20-28) zur Kommunikation zwischen den elektronischen Parksensormodulen (S1 - S_m) und einem Zentralrechner (29) versehen ist, wobei die elektronischen Parksensormodule (S1 - S_m) jeweils mit einem Identifikationscode und mit wenigstens einem Fahrzeugsensor zum Erkennen der Anwesenheit oder Abwesenheit eines Fahrzeugs auf dem jeweiligen Parkplatz (P) versehen

sind, wobei die elektronischen Parksensormodule dazu angeordnet sind, dem Zentralrechner (29) zu signalisieren, wenn ein Parkplatz belegt oder frei wird; und

wobei Fahrzeuge, die auf den Parkplätzen (P) geparkt werden können, jeweils mit einer elektronischen Zulassungsvorrichtung (30) versehen sind, wobei die Zulassungsvorrichtungen (30) jeweils mit Bewegungssensormitteln (33) und Zeitmessmitteln (35) sowie mit einer eindeutigen Identifikationsnummer und mit Übertragungsmitteln (36, 37) versehen sind, um die Identifikationsnummer der Zulassungsvorrichtung (30) des jeweiligen Fahrzeugs an den Zentralrechner (29) zu übertragen, wobei der Zentralrechner (29) so ausgelegt ist, dass er bestimmt, auf welchem Parkplatz (P) das jeweilige Fahrzeug geparkt ist, **dadurch gekennzeichnet, dass** Bewegungssensormittel (33) zusammen mit den Zeitmessmitteln (35) angeordnet sind, um genau zu bestimmen, zu welcher Zeit (t1) ein Fahrzeug zum Stillstand kommt; wobei die Übertragungsmittel (36, 37) angeordnet sind, um die genaue Zeit (t1) zusammen mit der Identifikationsnummer der Zulassungsvorrichtung des jeweiligen Fahrzeugs an den Zentralrechner (29) zu übertragen; und wobei der Zentralrechner angeordnet ist, um zu bestimmen, auf welchem Parkplatz das jeweilige Fahrzeug geparkt ist, indem er die Zeit (t1), wie sie dem Zentralrechner (29) durch die Übertragungsmittel (36, 37) bereitgestellt wird, mit Zeiten abgleicht, zu denen die Parkplätze (P) belegt werden, wie sie dem Zentralrechner (29) durch die elektronischen Parksensormodule (S1 - S_m) signalisiert werden.

2. Verfahren nach Anspruch 1, wobei nach der Zeit (t1), zu der das Fahrzeug zum Stillstand kommt, eine kurze Wartezeit (Δt_1) folgt, bevor sich die Zulassungsvorrichtung (30) mittels der Übertragungsmittel (36, 37) dem Zentralrechner (29) nähert.

3. Verfahren nach Anspruch 1 oder 2, wobei, nachdem das Fahrzeug zum Stillstand gekommen ist, durch die Bewegungssensormittel (33) direkt oder über einen Mikroprozessor ein zusätzliches Ortungssystem eingeschaltet wird, um zusätzliche Standortinformationen bereitzustellen.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei Zeitmessmittel (35) verwendet werden, die eine Echtzeituhr umfassen, und die Echtzeituhr mit einer Uhr des Parknetzwerkes (21 bis 28) und/oder des Zentralrechners (29) synchronisiert wird, bevor die Zeit, zu der ein Fahrzeug zum Stillstand kommt, mit den Zeiten verglichen wird, zu denen Parkplätze (P) belegt werden.

5. Verfahren nach einem der Ansprüche 1 bis 4, wobei die Übertragungsmittel (36, 37) ausgeschaltet wer-

den, solange das Fahrzeug in Bewegung ist und wenn das Fahrzeug an einem Ort geparkt ist, an dem kein Parknetzwerk (21 bis 28) vorhanden ist.

6. Verfahren nach einem der vorhergehenden Ansprüche, wobei mit Hilfe der Bewegungssensormittel (33) und der Zeitmessmittel (35) bestimmt wird, zu welcher Zeit (t2) ein geparktes Fahrzeug von einem Parkplatz wegfährt, und dass die Übertragungsmittel (36, 37) Informationen über diese Zeit (t2) zusammen mit der Identifikationsnummer der von diesem Fahrzeug mitgeführten Zulassungsvorrichtung an den Zentralrechner (29) übertragen.

7. System zum automatischen Erkennen und Überprüfen der Benutzung von wenigstens einer Anzahl von Parkplätzen (P) und ob ein Parkplatz durch ein autorisiertes Fahrzeug oder eine berechnete Person belegt ist, wobei das System umfasst:

einen Zentralrechner,
wenigstens ein elektronisches Parksensormodul (S1 - S_m), wobei jeder der genannten Parkplätze mit wenigstens einem elektronischen Parksensormodul (S1 - S_m) einer Parkanordnung (1) versehen ist,
ein Parknetzwerk (20-28), das mit der Parkanordnung zur Kommunikation zwischen den elektronischen Parksensormodulen (S1 - S_m) und dem Zentralrechner (29) vorgesehen ist, wobei die elektronischen Parksensormodule (S1 - S_m) jeweils mit einem Identifikationscode und mit wenigstens einem Fahrzeugsensor zum Erkennen der Anwesenheit oder Abwesenheit eines Fahrzeugs auf dem jeweiligen Parkplatz (P) versehen sind,
wobei die elektronischen Parksensormodule dazu angeordnet sind, dem Zentralrechner (29) zu signalisieren, wenn ein Parkplatz belegt oder frei wird; und
wobei das System ferner eine oder mehrere elektronische Zulassungsvorrichtungen (30) umfasst, die angepasst sind, mit den Fahrzeugen mitgeführt zu werden, die auf den Parkplätzen (P) geparkt werden können, wobei die Zulassungsvorrichtungen (30) jeweils mit Bewegungssensormitteln (33) und Zeitmessmitteln (35) sowie mit einer eindeutigen Identifikationsnummer und mit Übertragungsmitteln (36, 37) versehen sind, um die Identifikationsnummer der Zulassungsvorrichtung (30) eines jeweiligen Fahrzeugs an den Zentralrechner (29) zu übertragen, wobei der Zentralrechner (29) so ausgelegt ist, dass er bestimmt, auf welchem Parkplatz (P) das jeweilige Fahrzeug geparkt ist, **dadurch gekennzeichnet, dass** die Bewegungssensormittel (33) zusammen mit den Zeitmessmitteln (35) so angeordnet sind, dass sie

genau bestimmen, zu welcher Zeit (t1) ein Fahrzeug zum Stillstand kommt; wobei die Übertragungsmittel (36, 37) so ausgelegt sind, dass sie die genaue Zeit (t1) zusammen mit der Identifikationsnummer der Zulassungsvorrichtung des jeweiligen Fahrzeugs an den Zentralrechner (29) übertragen; und wobei der Zentralrechner durch den Abgleich der Zeit (t1), wie sie von den Übertragungsmitteln (36, 37) bereitgestellt wird, mit Zeiten, zu denen die Parkplätze (P) belegt werden, wie sie dem Zentralrechner (29) von den elektronischen Parksensormodulen (S1 - S_m) signalisiert werden, angepasst ist, um zu bestimmen, auf welchem Parkplatz das jeweilige Fahrzeug geparkt ist.

8. System nach Anspruch 7, wobei die Zulassungsvorrichtung einen Mikroprozessor (32) umfasst, der mit den Bewegungssensormitteln (33) und mit den Zeitmessmitteln (34, 35) verbunden ist und der ferner mit einer UHF-Funkschaltung (36, 37) der Übertragungsmittel zum Senden von Informationen an den Zentralrechner (29) verbunden ist.

9. System nach Anspruch 7 oder 8, wobei die Bewegungssensormittel (33) so ausgelegt sind, dass sie, nachdem ein Fahrzeug zum Stillstand gekommen ist, direkt oder über einen Mikroprozessor ein zusätzliches Ortungssystem einschalten, um zusätzliche Standortinformationen bereitzustellen.

10. System nach Anspruch 9, **dadurch gekennzeichnet, dass** die Zulassungsvorrichtungen (30) so ausgelegt sind, dass sie auch die zusätzlichen Standortinformationen an den Zentralrechner (29) übertragen.

11. System nach einem der Ansprüche 7 bis 10, wobei die Zeitmessmittel (34, 35) eine Echtzeituhr (35) umfassen und die Zulassungsvorrichtungen (30) so ausgelegt sind, dass sie die Echtzeituhr (35) mit einer Uhr des Parknetzwerks (21 bis 28) und/oder des Zentralrechners (29) synchronisieren, bevor die Zeit, zu der ein Fahrzeug zum Stillstand kommt, mit den Zeiten verglichen wird, zu denen Parkplätze (P) belegt werden.

12. System nach einem der Ansprüche 7 bis 11, wobei die Zulassungsvorrichtungen (30) so ausgelegt sind, dass sie die Übertragungsmittel (36, 37) ausschalten, solange das Fahrzeug in Bewegung ist und wenn das Fahrzeug an einem Ort geparkt ist, an dem kein Parknetzwerk vorhanden ist.

13. System nach einem der Ansprüche 7 bis 12, wobei die Zulassungsvorrichtungen so ausgelegt sind, dass sie bestimmen, zu welcher Zeit (t2) ein geparktes Fahrzeug von einem mit einem Parksensor-

modul ($S1 - S_m$) versehenen Parkplatz wegfährt, und dass sie Informationen über diese Zeit ($t2$) zusammen mit der eindeutigen Identifikationsnummer an den Zentralrechner übertragen.

Revendications

1. Procédé pour détecter et vérifier automatiquement l'utilisation d'au moins un certain nombre de places de stationnement (P) et si une place de stationnement est occupée par un véhicule ou une personne autorisé, dans lequel chacune desdites places de stationnement est pourvue d'au moins un module de capteur électronique de stationnement ($S1 - S_m$), d'un agencement de stationnement (1), qui est pourvu d'un réseau de stationnement (20-28) pour la communication entre les modules de capteur électronique de stationnement ($S1 - S_m$) et un ordinateur central (29), dans lequel les modules de capteur électronique de stationnement ($S1 - S_m$) sont chacun pourvus d'un code d'identification et d'au moins un capteur de véhicule pour détecter la présence ou l'absence d'un véhicule dans la place de stationnement respective (P), lesdits modules de capteurs de stationnement électroniques étant agencés pour la signalisation à l'ordinateur central (29) lorsqu'une place de parking devient occupée ou vacante; et dans lequel les véhicules, qui peuvent être stationnés dans lesdites places de stationnement (P), sont chacun pourvus d'un dispositif de licence électronique (30), les dispositifs de licence (30) étant chacun pourvus de moyens de détection de mouvement (33) et de moyens de mesure du temps (35) ainsi qu'avec un numéro d'identification unique et avec des moyens de transmission (36, 37) pour transmettre le numéro d'identification du dispositif de licence (30) d'un véhicule respectif à l'ordinateur central (29) dans lequel l'ordinateur central (29) est configuré pour déterminer dans quelle place de stationnement (P) le véhicule respectif est stationné, **caractérisé en ce que** des moyens de détection de mouvement (33), conjointement avec les moyens de mesure du temps (35) sont agencés pour déterminer exactement à quel moment ($t1$) un véhicule s'arrête; dans lequel les moyens de transmission (36, 37) sont configurés pour transmettre ledit moment exact ($t1$) conjointement avec le numéro d'identification du dispositif de licence du véhicule respectif à l'ordinateur central (29); et dans lequel l'ordinateur central est agencé pour déterminer dans quelle place de stationnement le véhicule respectif est stationné en faisant correspondre ledit moment ($t1$) tel que fourni à l'ordinateur central (29) par lesdits moyens de transmission (36, 37) avec des moments auxquels les places de stationnement (P) deviennent occupées comme indiqué à l'ordinateur central (29) par les modules de capteurs de stationnement électroniques

($S1 - S_m$).

2. Procédé selon la revendication 1, dans lequel après le moment ($t1$) auquel le véhicule s'arrête, une courte période ($At1$) d'attente suit avant que le dispositif de licence (30) prenne contact avec l'ordinateur central (29) au moyen des moyens de transmission (36, 37).
3. Procédé selon la revendication 1 ou 2, dans lequel après l'arrêt du véhicule, grâce aux moyens de détection de mouvement (33) directement ou via un microprocesseur, un système de localisation supplémentaire est mis en marche pour fournir des informations de localisation supplémentaires.
4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel on utilise des moyens de mesure du temps (35), qui comprennent une horloge en temps réel et l'horloge en temps réel est synchronisée avec une horloge du réseau de stationnement (21 à 28) et/ou de l'ordinateur central (29), avant que le moment auquel un véhicule s'arrête soit comparé aux moments auxquels les places de stationnement (P) deviennent occupées.
5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel les moyens de transmission (36, 37) sont éteints tant que le véhicule est en mouvement, et lorsque le véhicule est stationné dans un endroit où aucun réseau de stationnement (21 à 28) est présent.
6. Procédé selon l'une quelconque des revendications précédentes, dans lequel, à l'aide des moyens de détection de mouvement (33) et des moyens de mesure du temps (35), on détermine à quel moment ($t2$) un véhicule stationné s'éloigne d'une place de stationnement et que les moyens de transmission (36, 37) transmettent des informations sur ledit moment ($t2$) conjointement avec le numéro d'identification du dispositif de licence porté par ledit véhicule à l'ordinateur central (29).
7. Système de détection et de vérification automatique de l'utilisation d'au moins un certain nombre de places de stationnement (P) et de l'occupation d'une place de stationnement par un véhicule ou une personne autorisé, le système comprenant: un ordinateur central, au moins un module de capteur électronique de stationnement ($S1 - S_m$), dans lequel chacune desdites places de stationnement est pourvue d'au moins un module de capteur électronique de stationnement ($S1 - S_m$) d'un agencement de stationnement (1), un réseau de stationnement (20-28) qui est pourvu de l'agencement de stationnement pour la communication entre les modules de capteur électronique de stationnement ($S1 - S_m$) et l'ordinateur central (29), dans lequel les modules de capteur

électronique de stationnement (S1 - S_m) sont chacun pourvus d'un code d'identification et d'au moins un capteur de véhicule pour détecter la présence ou l'absence d'un véhicule dans la place de stationnement respective (P), lesdits modules de capteur électronique de stationnement étant agencés pour signaler à l'ordinateur central (29) lorsqu'une place de stationnement devient occupée ou vacante ; et dans lequel le système comprend en outre un ou plusieurs dispositifs de licence électroniques (30), adaptés pour être transportés avec les véhicules qui peuvent être stationnés dans lesdites places de stationnement (P), les dispositifs de licence (30) étant chacun pourvus de moyens de détection de mouvement (33) et des moyens de mesure du temps (35) ainsi d'un numéro d'identification unique et avec des moyens de transmission (36, 37) pour transmettre le numéro d'identification du dispositif de licence (30) d'un véhicule respectif à l'ordinateur central (29), dans lequel le l'ordinateur central (29) est configuré pour déterminer dans quelle place de stationnement (P) le véhicule respectif est stationné, **caractérisé en ce que** les moyens de détection de mouvement (33), ainsi que les moyens de mesure de temps (35) sont agencés pour déterminer exactement à quel moment (t1) un véhicule s'arrête; dans lequel les moyens de transmission (36, 37) sont configurés pour transmettre ledit moment exact (t1) conjointement avec le numéro d'identification du dispositif de licence du véhicule respectif à l'ordinateur central (29) ; et dans lequel l'ordinateur central est adapté, en faisant correspondre ledit moment (t1) tel que fourni par lesdits moyens de transmission (36, 37) avec des moments auxquels les places de stationnement (P) deviennent occupées comme signalé à l'ordinateur central (29) par les modules de capteur électronique de stationnement.(S1- S_m), pour déterminer dans quelle place de stationnement le véhicule respectif est stationné.

8. Système selon la revendication 7, dans lequel le dispositif de licence comprend un microprocesseur (32), qui est connecté aux moyens de détection de mouvement (33) et avec des moyens de mesure du temps (34, 35) et qui est en outre connecté à un circuit radio UHF (36, 37) des moyens de transmission pour envoyer des informations à l'ordinateur central (29).

9. Système selon la revendication 7 ou 8, dans lequel les moyens de détection de mouvement (33) sont configurés pour, après l'arrêt d'un véhicule, directement ou via un microprocesseur, mettre en marche un système de localisation supplémentaire pour fournir des informations de localisation supplémentaires.

10. Système selon la revendication 9, **caractérisé en**

ce que les dispositifs de licence (30) sont configurés pour transmettre également les informations de localisation supplémentaires à l'ordinateur central (29).

11. Système selon l'une quelconque des revendications 7 à 10, dans lequel les moyens de mesure du temps (34, 35) comprennent une horloge en temps réel (35) et en ce que les dispositifs de licence (30) sont configurés pour synchroniser l'horloge en temps réel (35) avec une horloge du réseau de stationnement (21 à 28) et/ou avec l'ordinateur central (29) avant que le moment auquel un véhicule s'arrête soit comparé aux moments auxquels les places de stationnement (P) deviennent occupées.

12. Système selon l'une quelconque des revendications 7 à 11, dans lequel les dispositifs de licence (30) sont configurés pour désactiver les moyens de transmission (36, 37) tant que le véhicule est en mouvement et lorsque le véhicule est stationné dans un endroit où aucun réseau de stationnement n'est présent.

13. Système selon l'une quelconque des revendications 7 à 12, dans lequel les dispositifs de licence sont configurés pour déterminer à quel moment (t2) un véhicule stationné s'éloigne d'une place de stationnement équipée d'un module de capteur de stationnement (S1 - S_m) et à transmettre des informations sur ce moment (t2) avec le numéro d'identification unique à l'ordinateur central.

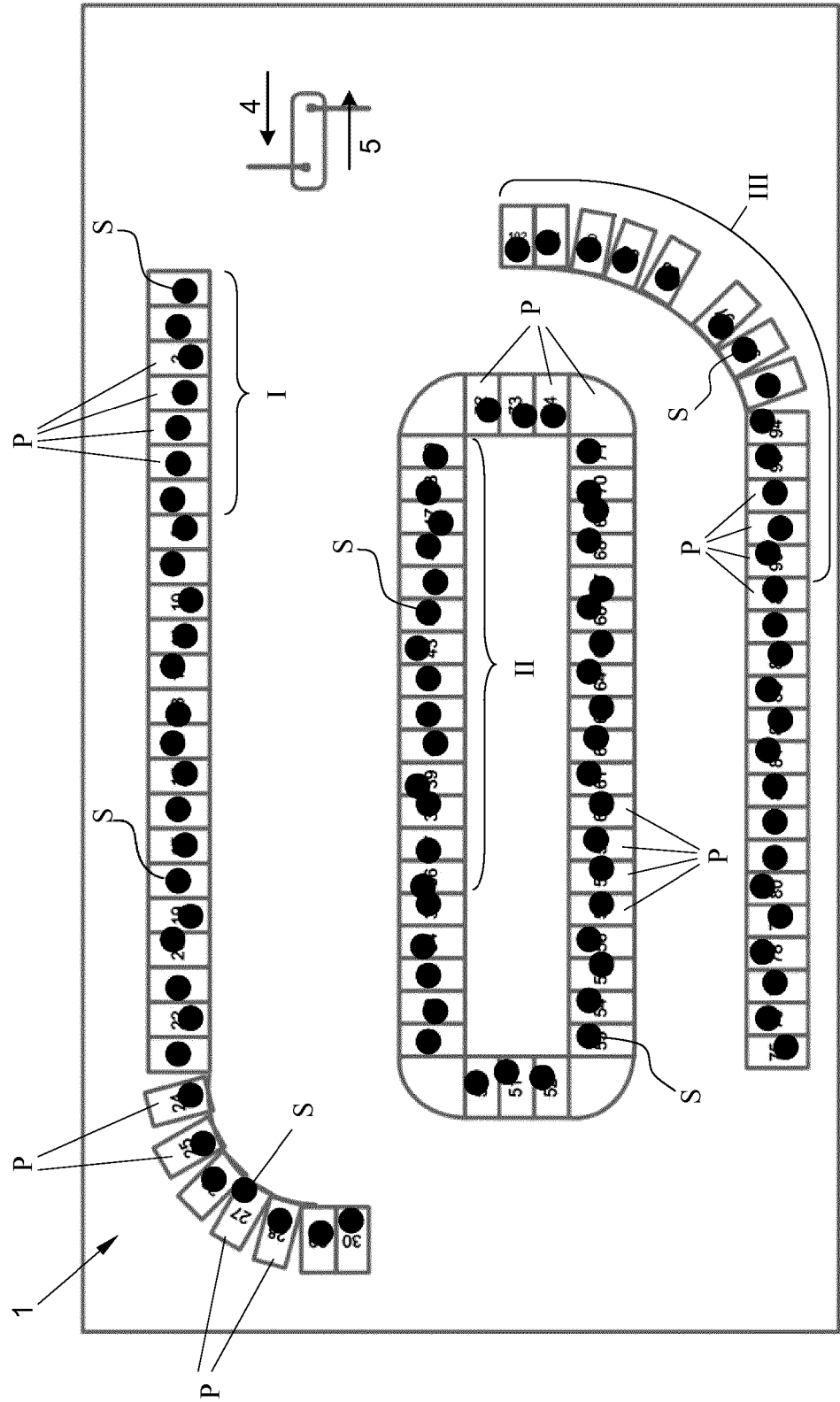


Fig. 1

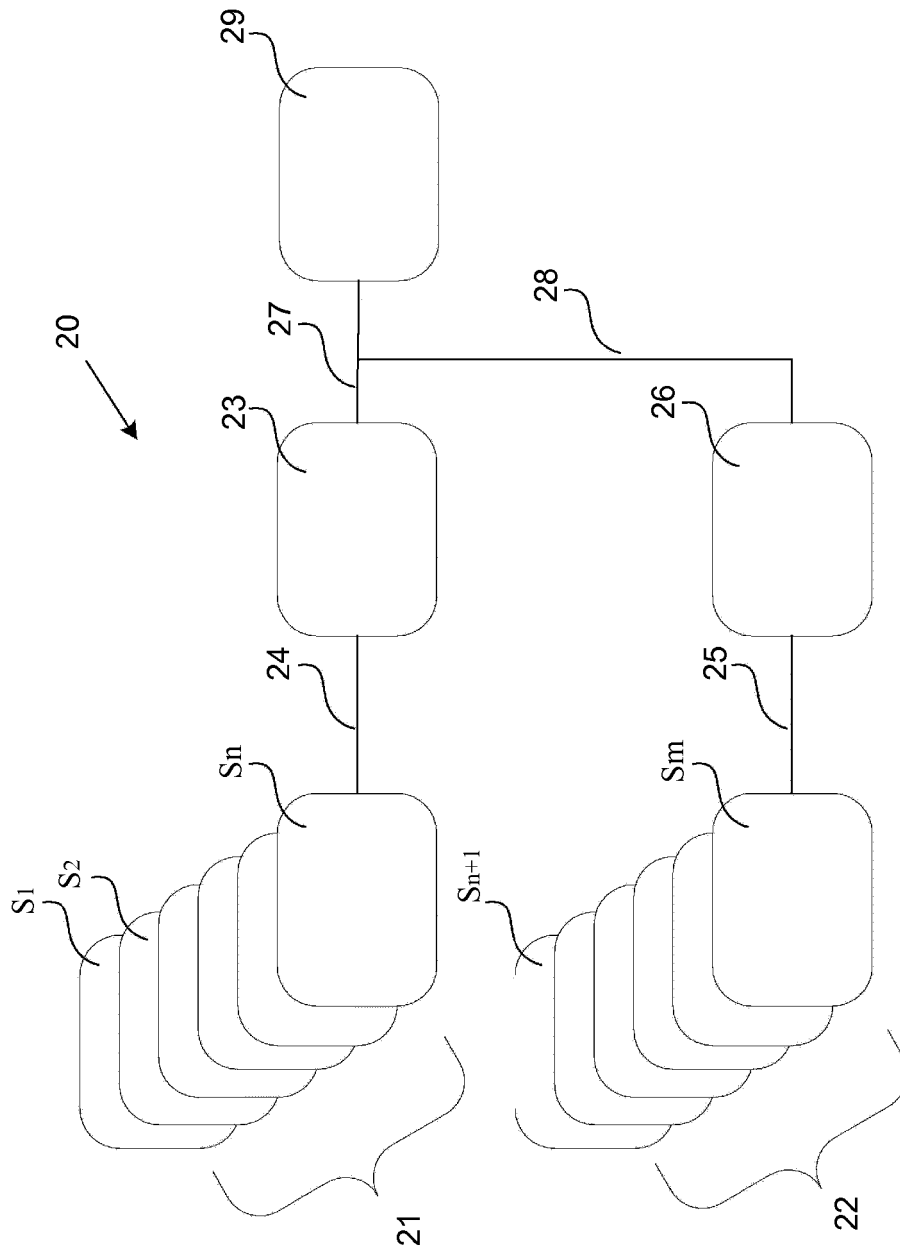


Fig. 2

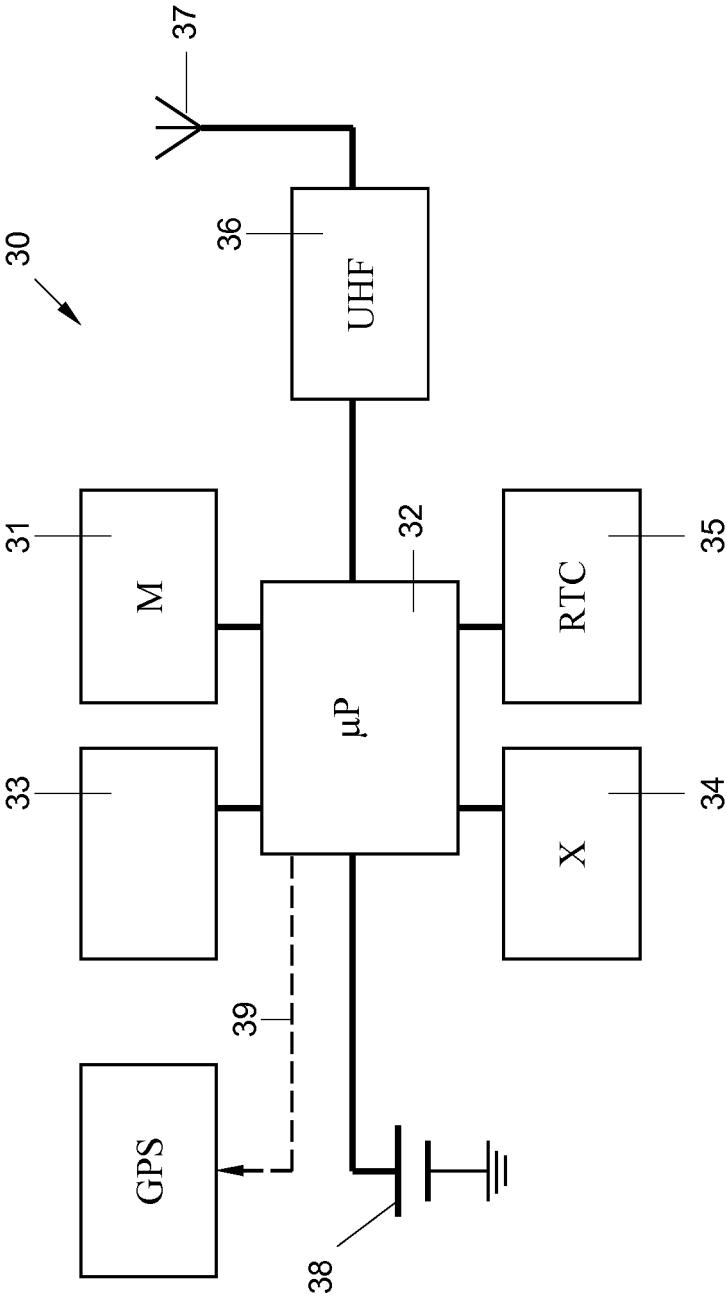


Fig. 3

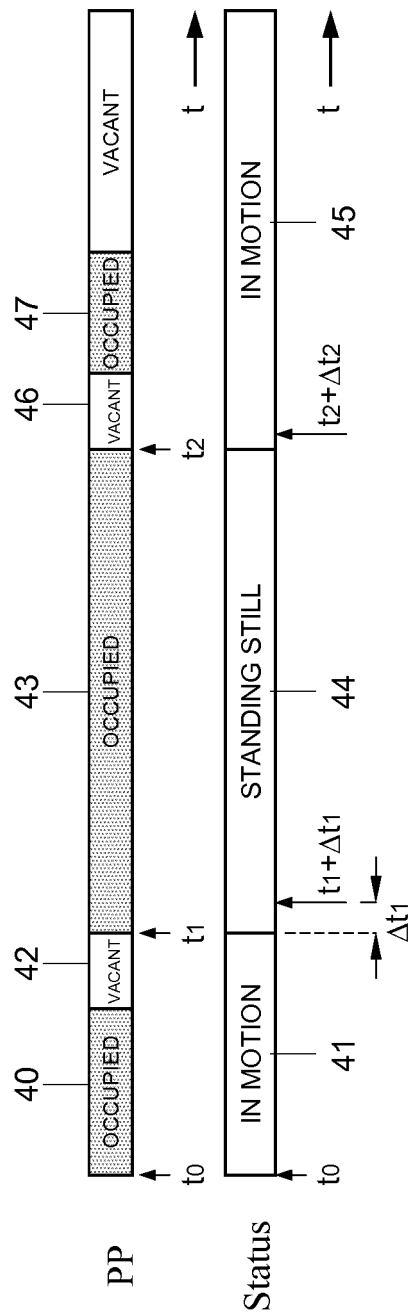


Fig. 4

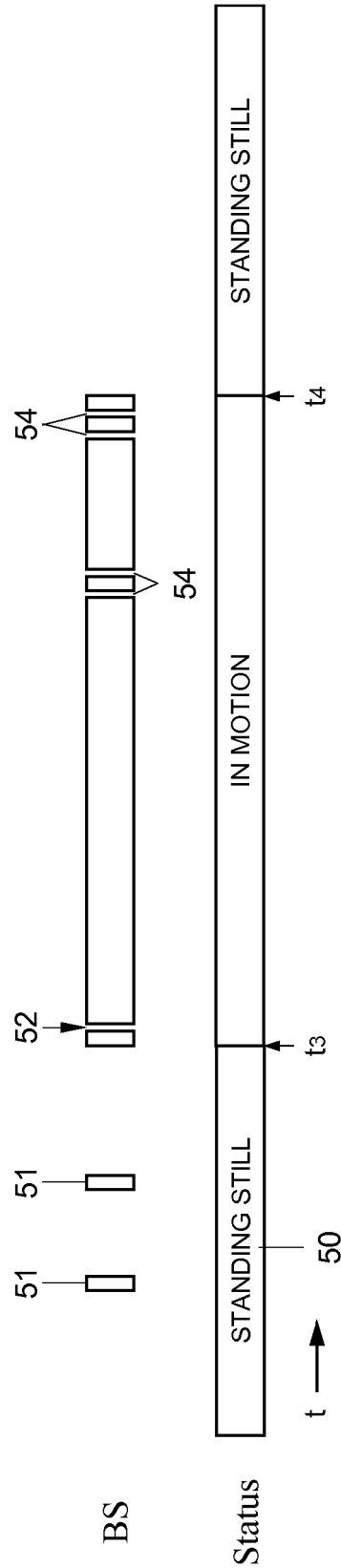


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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